

REMARKS

The office action of August 27, 2007, has been carefully considered.

It is noted that the abstract of the disclosure is objected to.

A substitute specification is required.

Claims 1, 9, 11, 14 and 19 are objected to for containing various informalities.

Claims 1, 3 and 5-13 are rejected under 35 U.S.C. 102(b) over the patent to Kamp.

Claims 1, 2 and 4 are rejected under 35 U.S.C. 102(b) over the patent to Bechem et al.

Claims 1, 3, 4 and 11-14 are rejected under 35 U.S.C. 102(b) over the patent to Sugden.

Claims 1-4 and 14-16 are rejected under 35 U.S.C. 102(b) over

the patent to Leroy.

Claims 1, 14, 16-18, 21 and 22 are rejected under 35 U.S.C. 102(b) over the patent application of Rives.

Claims 19 and 20 are rejected under 35 U.S.C. 103(a) over Rives in view of the patent to Haspert et al.

In connection with the Examiner's objections to the abstract, applicant has canceled the original abstract and attached hereto a new Abstract of the Disclosure. With this change it is respectfully submitted that the objection to the abstract of the disclosure is overcome and should be withdrawn.

Applicant has also provided the required substitute specification. The substitute specification contains no new matter.

In view of the Examiner's objection to and rejections of the claims, applicant has amended claims 1, 9, 11, 14 and 19.

In view of the changes to the claims it is respectfully submitted that the objection to claims 1, 9, 11, 14 and 19 for

containing informalities is overcome and should be withdrawn.

It is respectfully submitted that the claims presently on file differ essentially and in an unobvious, highly advantageous manner from the constructions disclosed in the references.

The patent to Kamp discloses a device for down-hole drilling. The device has a drill head non-rotatably fixed on the output shaft 5. The shaft 5 is connected by a connecting rod 4 to the rotor 2 of a fluid drive motor. The shaft is rotatably arranged in the housing 1 at an angle to the longitudinal direction with the help of a bearing unit 11. When the motor is driven the drill head rotates about the axis II defined by the shaft. Since the axis II is at an angle to the longitudinal axis I of the housing there is no straight boring operation, instead a curved operation as shown in Fig. 3.

To accomplish a straight boring, as shown in Fig. 2, the housing can be rotated about the axis I so that the axis II wobbles about the axis I.

In contrast to this, the presently claimed invention is a device for driving boreholes in the ground, having a rotationally driven main shaft (12) comprising a shaft journal (11) whose axis (B) forms an acute angle (w) with respect to the axis (A) of the main shaft (12). The main shaft (12) is driven about the axis (A) so that, in contrast to Kamp, the shaft journal (11) runs about the axis (A) on a conical surface.

In the device of Kamp, the drill head is non-rotatably attached to the shaft. In contrast, in the present invention the drill head is rotatable about the axis (B) of the shaft journal. A rotation of the main shaft about the axis (A) thus leads only to a wobbling movement of the drill head, not to a rotation.

To accomplish rotation, the drill head is provided with a circumferential region (18) that runs on a complimentary circumferential region (19) when the drill head is induced into the wobbling movement by the rotationally driven main shaft (12). Kamp does not disclose the circumferential regions as recited in claim 1. This also shows that in Kamp a wobbling movement of the drill head is only achieved by a rotation of the housing of the

device, whereas in the presently claimed invention the rotational drive of the main shaft produces the wobbling movement as well as the rotational movement of the drill head.

In order to vary the relationship between the wobbling frequency and the rotational frequency, in the present invention the complementary circumferential region is itself set into rotation. There is no disclosure of this by Kamp.

In view of these considerations it is respectfully submitted that the rejection of claims 1, 3 and 5-13 under 35 U.S.C. 102(b) over the above-discussed reference is overcome and should be withdrawn.

The patent to Bechem et al. discloses an activated earth drill having a drill rod 10 with a guide rod 20. In the forward drive direction, behind the guide rod, on each side of the drill rod, are two rock cutters 16, 18. The cutters are rotatably mounted on opposing ends of a drive shaft 26 of a motor 28 via eccentric sleeves 30 and roller bearings 36. A ring gear 32 is provided static to the motor housing, in which a pinion gear 34 runs. The pinion gear 34 is nonrotatably connected to the drill

head. By driving the shaft 26 to rotate, a movement of the cutters 16, 18 parallel to the longitudinal direction of the drill rod takes place due to the eccentricity, as well as a rotation about the axis B due to the running of the outer toothing on the drill head in the inner toothing non-rotatably connected to the motor housing. As is evident from Figs. 1-3 of Bechem et al. the rotational axes of the drive shaft 26 and the cutter are parallel. A rotationally driven main shaft comprising a shaft journal whose axis forms an acute angle with respect to. the axis of the main shaft is not disclosed by Bechem et al. Furthermore, the ring gear 32 of Bechem et al, cannot be set into rotation.

In Figs. 5 and 6 of Bechem et al. is shown an embodiment in which the eccentric axes of the cutter are no longer parallel to each other, but instead they are at an obtuse angle to each other (see Fig. 5). In order to still drive both cutters with a single motor 48, the primary drive shaft 50 is connected to the inclined secondary drive shaft 52 by a universal coupling 54. The mounting of the inclined drive shafts is accomplished with a cage 56 that is fixed to the motor so that the inclined shafts 52, in contrast to the shaft journals of the presently claimed invention, execute

no movement on a cone about the axis of the main shaft. A wobbling movement of the cutters 16, 18 is also not possible due to the construction of the element 14 in Figs. 5 and 6 of Bechem et al.

A housing 64 is nonrotatably fixed with the cutters, which housing carries the ring gear 66. The ring gear 66 is partially engaged with a fixed pinion gear 60. Although in Figs. 5 and 6 of Bechem et al. the outer circumferential region moves, the inner circumferential region, which forms the complimentary circumferential region, is fixed and cannot be made to rotate. Thus, Bechem et al. do not disclose the presently claimed invention.

In view of these considerations it is respectfully submitted that the rejection of claims 1, 2 and 4 under 35 U.S.C. 102(b) over the above-discussed reference is overcome and should be withdrawn.

The patent to Sugden discloses a cutting device with a rotating disc. This device works on the basis of undercutting. In

order to accomplish this the cutting discs are rotatably mounted on a mounting section 19 of a driven mounting shaft 13 by bearings 39, 53. The shaft journals are angled at an acute angle to the axis A-A, about which the shaft is driven, and is offset to the side so that the axis A-A and the central longitudinal axis B-B of the shaft journals intersect outside the device. The cutting discs rest with a spherical contact surface against a complimentary spherical surface on the housing, whereby the center of curvature lies at the point of intersection of the axes A-A and B-B.

If the shaft is now driven, the cutter discs execute an oscillating movement generally perpendicular to the axis A-A (see col. 5, lines 64-66), as well as a wobbling movement generally in the direction S in Fig. 3 (see col. 5, line 66 - col. 6, line 2).

A circumferential region which runs on a complementary circumferential region so as to rotate the drill head based on the wobbling of the drill head is not disclosed by Sugden. In particular, the surfaces of the bearing 39, which are considered by the Examiner to be circumferential and complimentary

circumferential surfaces, are not suited to set the cutter into rotation when the shaft 18 is driven. Furthermore, the complimentary circumferential region of Sugden cannot be caused to rotate so as to change the relationship between the wobbling and rotation frequencies of the cutter. Thus, it is submitted that Sugden does not disclose the presently claimed invention.

In view of these considerations it is respectfully submitted that the rejection of claims 1, 3, 4 and 11-14 under 35 U.S.C. 102(b) over the above-discussed reference is overcome and should be withdrawn.

The patent to Leroy discloses an articulated tool for drilling wells. The tool has two main components, namely a hollow shaft 1 and a tool body 2, which on its closed end carries cutting tips 22. The hollow shaft and the tool body are connected together by a ball joint 4, 5 on the end of the hollow shaft, so that the tool body can be tipped relative to the hollow shaft. Transfer of torque from the hollow shaft to the tool body takes place via toothings 7, 8. Due to this arrangement, the tool body driven by the hollow shaft can be tipped at an acute angle to the longitudinal axis of the hollow shaft during boring.

Leroy does not disclose a shaft journal that forms an acute angle to the axis of the main shaft, as in the presently claimed invention. Furthermore, the drill head is not mounted so that it can rotate about the axis of the shaft journals. Finally, there is not disclosure of a circumferential region on the drill head that runs in a complimentary circumferential region, in particular no complimentary circumferential region is set into rotation. Thus, it is submitted that Leroy does not disclose the presently claimed invention.

In view of these considerations it is respectfully submitted that the rejection of claims 1-4 and 14-16 under 35 U.S.C. 102(b) over the above-discussed reference is overcome and should be withdrawn.

The patent application of Rives discloses a nutating single cone drill bit. Rives has a reference date of April 14, 2003. The present application is a National Phase of an International application claiming priority of German applications filed July 26 and August 18, 2002. Thus, it is submitted that Rives is not prior art to the present application.

In any event, Rives does not disclose a drill head with a circumferential region that runs in a complimentary circumferential region so that by rotation of the main shaft and the associated wobbling movement the drill head sets itself into rotation about the axis defined by the shaft journals. Additionally, Rives does not disclose setting a complimentary circumferential region into rotation, as in the presently claimed invention. Thus, it is respectfully submitted that Rives does not disclose the presently claimed invention.


In view of these considerations it is respectfully submitted that the rejection of claims 1, 14, 16-18, 21 and 22 under 35 U.S.C. 102(b) over the above-discussed reference is overcome and should be withdrawn.

Furthermore, Haspert adds nothing to Rives so as to suggest the present invention. Therefore, it is respectfully submitted that the rejection of claims 19 and 20 under 35 U.S.C. 103(a) is overcome and should be withdrawn.

Reconsideration and allowance of the present application are respectfully requested.

Any additional fees or charges required at this time in connection with this application may be charged to Patent and Trademark Office Deposit Account No. 11-1835.

Respectfully submitted,

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CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, PO Box 1450 Alexandria, VA 22313-1450, on February 27, 2008.

By: 
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Date: February 27, 2008